

A REVIEW OF THE GENUS DENDROBIUM (ORCHIDACEAE) IN AUSTRALIA.

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(Five Text-figures.)

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In the course of this review we shall have to give a large number of references to botanical publications. With a view to economy of space we are therefore using some abbreviations other than those commonly employed, and we think it will be helpful to set out here a list of the chief abbreviations used throughout the paper.

A.O.R.	denotes	<i>The Australian Orchid Review</i> (Sydney).
Bail. Q. Fl.	"	Vol. V (only) of F. M. Bailey's Queensland Flora.
Benth.	"	Vol. VI (only) of Bentham's <i>Flora Australiensis</i> .
Bot. Jahrb.	"	<i>Engler's Botanische Jahrbucher</i> .
Bot. Mag.	"	<i>Curtis's Botanical Magazine</i> .
Bot. Reg.	"	<i>Edwards's Botanical Register</i> .
Fedde, Rep.	"	Fedde, <i>Repertorium novarum specierum regii vegetabilis</i> .
Fitzg. A.O.	"	R. D. Fitzgerald's <i>Australian Orchids</i> .
Fitz. ined.	"	R. D. Fitzgerald's unpublished plates in the Mitchell Library, Sydney.
Gard. Chron.	"	<i>The Gardener's Chronicle</i> (London).
Journ. Bot.	"	<i>Journal of Botany</i> (London).
J. J. Sm.	"	J. J. Smith, Dutch botanist.
Krztl.	"	F. Kranzlin, German botanist.
Fragm.	"	F. Mueller's <i>Fragmenta Phytographiae Australiae</i> .
N.Q. Nat.	"	<i>The North Queensland Naturalist</i> (Cairns).
Nov. Guin.	"	Nova Guinea, Orchid Section, by J. J. Smith.
Orch. Alb.	"	Warner and Williams, <i>Orchid Album</i> (London).
Orch. N.G.	"	Schlechter's <i>Orchids of New Guinea</i> (Fedde, Rep.).
Orch. N.S.W.	"	Rupp's <i>Orchids of New South Wales</i> (Sydney).
Orch. Rev.	"	<i>The Orchid Review</i> (London).
Pflanz.	"	<i>Engler's Das Pflanzenreich</i> , iv, 50, ii, B. 21 (1910).
Proc. R.S.Q.	"	<i>Proceedings of the Royal Society of Queensland</i> .
Q.A.J.	"	<i>Queensland Agricultural Journal</i> .
Q. Nat.	"	<i>The Queensland Naturalist</i> (Brisbane).
R. Br.	"	Robert Brown's <i>Prodrromus</i> , 1810 edition.
Rechb. f. Xen.	"	H. G. Reichenbach, <i>Xenia Orchidacea</i> (1858).
Sm. Ex. Bot.	"	Sir J. E. Smith's <i>Exotic Botany</i> (1804).
Sert. Astrol.	"	<i>Voyage of the Astrolabe</i> (Richard).
S.M.H.	"	<i>The Sydney Morning Herald</i> .
Wing's S. Sci. Rec.	"	<i>Wing's Southern Science Record</i> (Melbourne).

DENDROBIUM is probably the largest genus in the great family of the Orchidaceae, its only possible rival being BULBOPHYLLUM. It has an extensive distribution, from Japan in the north to Tasmania and New Zealand in the south, and from the foothills of the Himalayas eastward through tropical Asia, Malaya, Indonesia, the Philippines, and most of the islands of the western Pacific. We cannot give an exact statement of the number of known species, but it almost certainly exceeds a thousand. Six hundred have been described from New Guinea alone. Beyond the fact that nearly all are either epiphytes or rock-plants, it is impossible to describe in general terms the multiplicity of forms and habits exhibited by the members of this great group of orchids. Even as concerns the floral structure, there are some species so close to the borderline of other genera that it is difficult to determine their proper position.

In the *Australian Orchid Review* for March, 1942, there appeared a valuable synopsis of the species of DENDROBIUM known or reputed to occur in Australia. It was contributed

by C. T. White, F.L.S., Government Botanist of Queensland. He enumerates the following 62 plants, but makes it clear that he does not accept all as genuine Australian Dendrobes.

<i>D. Adae</i>	<i>D. dicuphum</i>	<i>D. Jonesii</i>	<i>D. Smilliae</i>
<i>agrostophyllum</i>	<i>Ellen</i>	<i>Keffordii</i>	<i>speciosum</i>
<i>atroviolaceum</i>	<i>elongatum</i>	<i>Kestevenii</i>	<i>striolatum</i>
<i>Baileyi</i>	<i>eriaeoides</i>	<i>Kingianum</i>	<i>Stuartii</i>
<i>Bairdianum</i>	<i>falcorostrum</i>	<i>lichenastrum</i>	<i>Sumneri</i>
<i>Beckleri</i>	<i>Fitzgeraldii</i>	<i>linguiforme</i>	<i>superbiens</i>
<i>bifalce</i>	<i>Fleckeri</i>	<i>monophyllum</i>	<i>Taylori</i>
<i>bigibbum</i>	<i>fuscum</i>	<i>Mortii</i>	<i>tenuissimum</i>
<i>Bowmanii</i>	<i>fusiforme</i>	<i>Muellerianum</i>	<i>teretifolium</i>
<i>Brandtia</i>	<i>Goldiei</i>	<i>ophioglossum</i>	<i>tetragonum</i>
<i>canaliculatum</i>	<i>Gouldii</i>	<i>Palmerstoniae</i>	<i>Toftii</i>
<i>Carrii</i>	<i>gralicacule</i>	<i>Phalaenopsis</i>	<i>undulatum</i>
<i>cucumerinum</i>	<i>Grimesii</i>	<i>Prenticei</i>	<i>variabile</i>
<i>delicatulum</i>	<i>hispidum</i>	<i>pugioniforme</i>	<i>Wilkinsonum</i>
<i>delicatum</i>	<i>Johannis</i>	<i>rigidum</i>	
	<i>Johnsoniae</i>	<i>Schneiderae</i>	

To these we add the following:

<i>D. ancorarium</i>	<i>D. cancroides</i>	<i>D. Hollrungii</i>	<i>D. luteocilium</i>
<i>antennatum</i>	<i>Foelschei</i>	<i>Nindii</i>	<i>uniflos</i>
<i>aurantiaco-</i>	<i>gracillimum</i>		
<i>purpureum</i>			

This makes a total of 72. White excludes eight from his list. We delete nine more from the total.

EXCLUDED SPECIES (17).

- D. atroviolaceum* Rolfe in *Gard. Chron.* (1890), i, 463, 512. This New Guinea species was reported to have been found some years ago on the Mossman River, N. Queensland. The report has not been confirmed, and there is no real evidence for the occurrence of the plant in Australia.
- D. ancorarium* Rupp in *Q. Nat.*, May, 1945. Our reason for rejecting this is discussed in connection with *D. Adae* Bail, q.v.
- D. antennatum* Lindl. in *Journ. Bot.* 1843, 236. Given by F. Mueller as an Australian species in his 2nd Syst. Census of Austr. Pl. (1889), but it is a New Guinea plant, and Mueller's record is probably a mistake. He gave no locality, and there are no Australian reports of the species.
- D. Bowmanii* Benth. 286. A synonym of *D. Mortii* F. Muell., q.v.
- D. Brandtia* Krzl. in *Gard. Chron.* (1906), 404. Another New Guinea species, for the occurrence of which in Australia there is no evidence. The only remark on its habitat given by Kranzlin is that it "resembles *D. Phalaenopsis*, *D. bigibbum*, *D. dicuphum*, and other Dendrobes from North Australia or New Guinea".
- D. delicatulum* F. Muell. et Krzl. in *Osterr. Bot. Zeitschr.*, 44 (1894), 162; et Krzl. in *Pflanz.*, 77. Confusion has arisen from the fact that Kranzlin had previously published another species (from New Guinea) under this name, but afterwards suppressed it. Why he and Mueller, still later on, used the name for a different species is not explained. It is this later plant which was supposed to occur in Australia, but the supposition is based on a geographical error of Kranzlin. In the original description the authors make it quite clear that the species belonged to New Guinea, but they had seen specimens "cultivated by colonists at Moreton Bay". Sixteen years afterwards Kranzlin republished the species in *Pflanz.*, l.c. (Mueller was then dead). He says "Neu-Guinea, sudostlicher Teil, Moreton-Bai". Apparently he was under the impression that Moreton Bay was in New Guinea. There is no authentic record for *D. delicatulum* in Australia.
- D. Ellen*. As White states, this is an artificial hybrid between *D. Kingianum* (female) and *D. tetragonum*. It was raised by W. Schmidt at Turrumurra, N.S.W., and is a most attractive little orchid, but it cannot rank as an Australian species.
- D. eriaeoides* Bail. in 2nd Suppl. to *Synopsis Q. Fl.* (1888), et in *Q. Fl.* 1535. R. A. Rolfe removed this plant to the genus *Eria*. (*Orch. Rev.*, xvii (1909), 95.)

In the following year Kranzlin (*Pflanz.*, 249) supported Bailey's view and kept it in *Dendrobium*. Bailey based his determination on the pollinia, which he said agreed both in form and number with those of *Dendrobium*, though he expressed doubts about the final inclusion of the plant in that genus. We had not been able to investigate the matter of the pollinia ourselves, and were prepared to follow Bailey and Kranzlin; but a personal communication from W. H. Nicholls of Melbourne put a different aspect on the subject. Nicholls grew the species in his glass-house for several years; it flowered freely, and he dissected and examined numerous flowers. He sent us copies of his drawings made during these observations. The pollinia are perfectly characteristic of *Eria*; pyriform, 8 in number, arranged in two sets of fours. Either Bailey's specimens must have been abnormal, or he somehow mistook the character of the pollinia. Rolfe's transfer of the plant to *Eria* must be upheld.

9. *D. Foelschei* F. Muell. in *Wing's S. Sci. Rec.* (1882), 230. We regard this as a form of *D. canaliculatum* R.Br., q.v.
10. *D. Fitzgeraldii* F. Muell., in *The Melbourne Chemist*, June, 1884. It is generally accepted that this is conspecific with *D. superbiens* Rchb. f.
11. *D. Goldiei* Rchb. f. in *Gard. Chron.* (1878), 1, 652. A variety of *D. superbiens* with flowers of a richer colour than the type form.
12. *D. elongatum* Cunn. in Lindley, *Bot. Reg.* 1839, Misc. 33. Name invalid. F. Mueller's name *gracilicaule* is the valid name for this species.
13. *D. hispidum* A. Rich. in *Sert. Astrol.*, 13, t. 5. Transferred by Schltr. to the genus *Cadetia*. (Fedde, Rep. i, 1912, 424.)
14. *D. Johnsoniae* F. Muell. in *Wing's S. Sci. Rec.* (1882), 95, et in *Gard. Chron.* (1891), 1, 552. This magnificent orchid was recorded for Cape York by Kranzlin (*Pflanz.*, 260), but he does not say on whose authority, and no other record is known. Bailey did not consider it an Australian species. Mueller originally described it from a specimen sent by the well-known New Guinea missionary, the Rev. James Chalmers, at whose request he named it in honour of a Miss Johnson of Surry Hills, N.S.W. Fitzg. ined., No. 89, with no name attached, undoubtedly represents *D. Johnsoniae*. There is a faint inscription on this plate, "Dinner Island, 28 August, 1888". Now there is a diminutive islet near Mackay, Queensland, bearing that name, but as the result of inquiries we are convinced that no such orchid as *D. Johnsoniae* could ever have grown there. But "Dinner Island" years ago was the name commonly used for the island of Samarai, at the S.E. extremity of Papua. It was certainly known by that name to Chalmers, who had a mission station there. We think it most likely that this was the locality for Fitzgerald's plant. In deleting *D. Johnsoniae* from the list of Australian species, of course we exclude with it the synonyms *D. niveum* Rolfe in *Gard. Chron.* (1891), I, 104, and *D. Macfarlanei* Rchb. f., *ibid.* (1882), II, 520. Reichenbach's name in any case is invalid, being preoccupied by Mueller for another species.
15. *D. Nindii* W. Hill, in Parliamentary Report of Brisbane Botanic Gardens for 1874. Hill's description is far too inadequate to be accepted for the establishment of a new species. No floral particulars are given beyond the vague remark that there were "eighteen or more large purple, lilac flowers". We can discover no subsequent reference to *D. Nindii* in botanical literature.
16. *D. Taylori* Fitzg., A.O. ii, 3. Transferred by Schltr. to the genus *Cadetia*. (Fedde, Rep., l.c.)
17. *D. uniflos* Bail. in *Proc. R.S.Q.*, i (1884), 11. A synonym of No. 16.

Deleting, then, the above 17, we are left with a total of 55 species. Beyond references to the original descriptions, we are unable to supply any information concerning the following six, which do not appear to have been recorded again since they were described.

1. *D. Baileyi* F. Muell. *Fragm.* viii (1874), 173; see also Bail. *Q. Fl.*, 1530.
2. *D. Jonesii* Rendle in *Journ. Bot.*, xxxix (1901), 197. (See *D. gracillimum* below.)
3. *D. Muellermanum* Schltr. in Fedde, Rep. iii (1907), 316.
4. *D. Palmerstoniae* Schltr., l.c., 317.

5. *D. Stuartii* Bail. in *Proc. R.S.Q.*, i (1884), et in *Q. Fl.*, 1529.
6. *D. Sumneri* F. Muell. *Fragm.* vi (1867), 94. In a personal communication, W. H. Nicholls informs us that he has examined Mueller's type in the Melbourne Herbarium, and cannot distinguish it from *D. bigibbum* Lindl. Bailey omits it from *Q. Fl.* But see Benth., 278, where it is stated to lack the double spur of *D. bigibbum*.

Of the remaining 49 species there are nine which, in our opinion, have been so adequately dealt with in previous publications that we do not feel we can add anything of value to what has been said. We shall therefore only enumerate these species, with references to their bibliography, and brief indications of their habitats. Two special notes, however, are inserted, one under *D. fusiforme* and one under *D. striolatum*.

7. *D. aemulum* R. Br. 333; Benth. 280; Bail. *Q. Fl.* 1527; *Orch. N.S.W.* 117; Fitzg. *A.O.* i, 2; *A.O.R.*, June, 1938, 44. From the Clyde River in southern N.S.W. to the Atherton Tableland in North Queensland.
8. *D. Bairdianum* Bail. in 1st Suppl. to *Synopsis Q. Fl.* et in *Q. Fl.* 1528; Nicholls in *N.Q. Nat.*, July, 1936. Coastal ranges of North Queensland.
9. *D. cucumerinum* Macleay in Lindl. *Bot. Reg.* (1842), Misc. 58; Benth. 283; Bail. *Q. Fl.* 1532; Fitzg. *A.O.* i, 6; *Bot. Mag.* 4619. Open forests E. of the Dividing Range, from Burragorang, N.S.W., to southern Queensland.
10. *D. fusiforme* Bail., *Q. Fl.* 1527; *A.O.R.* Dec., 1939, 114, et June, 1945, 40. N. Queensland coastal and tableland forests.

Bailey (*Q. Fl.*, l.c.) refers to these PROCEEDINGS, ii (1878), 277, for the original description of *D. fusiforme*. But he did not describe the species there. He recorded it as "a well-marked variety" of *D. speciosum*, mentioning a few of its characteristics; then he added that he had supposed it to be a distinct species, and had described it under the name *D. fusiforme*. But he did not say where, if anywhere, such description had been published, nor can we find any reference or allusion to it elsewhere. We consider therefore that "Q. Fl. V, 1527" is the correct citation for the original publication of this species, and that the reference to these PROCEEDINGS should be given only in connection with its synonymy. (*D. speciosum* var. *fusiforme*.)

11. *D. monophyllum* F. Muell. *Fragm.* i (1858), 189; Benth. 282; Bail. *Q. Fl.* 1531; Fitzg. *A.O.* i, 6; *Orch. N.S.W.* 118. Common in scrubs and forests from the Clarence River, N.S.W., northward into the Queensland tropics.
12. *D. pugioniforme* Cunn. in Lindl. *Bot. Reg.* xxv (1839), Misc. 33; Benth. 284; Bail. *Q. Fl.* 1532; *Orch. N.S.W.*, Plate xxi; Fitzg. ined. No. 86. Common in rain forests, especially on mountains, less frequently at lower levels, from southern N.S.W. at least as far north as the Bunya Mountains in Queensland.*
13. *D. rigidum* R. Br. 333; Benth. 284; Bail. *Q. Fl.* 1533; Fitz. *A.O.* i, 4. North Queensland forests.
14. *D. striolatum* Rchb. f. in Hamburg. *Gart.* xiii (1857), et in *Xen.* ii, 24, t. 109; Benth. 285; F. Muell., *Key to Syst. Vict.*, Pl. ii, fig. 112; *Vict. Nat.*, Jan., 1938 (a beautiful plate of plants in situ, facing p. 141). From ranges near the South Maitland Coalfields in N.S.W., southwards to eastern Victoria; also in Tasmania, where it is the only species of *Dendrobium*.

We cannot discover the basis for the following record by Bailey in *Proc. R.S.Q.*, i (1884), 13: "*D. striolatum* Rchb. f., var. *Beckleri* F.v.M. *Fragm.*, v, 95. Fitzgerald, Part VI." Mueller does not even mention *D. striolatum* in *Fragm.* v (1855-6), though on p. 94 he records it under the name *D. Milliganii*, which he subsequently abandoned in favour of Reichenbach's earlier name. On p. 95 he records *D. Beckleri* for the Clarence River, without comment. Actually he had not then published any description of that species, nor did he do so until 1869 (*Fragm.* vii, 59). Below the description he briefly alludes to affinities with *D. striolatum* and *D. Mortii*. Fitzgerald never published

* In his article in *A.O.R.*, March, 1947, on the orchids of Cape York, Dr. H. E. Young records *D. pugioniforme* as abundant on the Peninsula; but specimens which he lodged with the Government Botanist at the Brisbane Herbarium have been identified as *D. rigidum* R. Br.

D. striolatum at all, nor does he allude to it in the text accompanying his plate of *D. Beckleri* in *A.O.* I, 7. Whatever be the explanation of Bailey's record cited above, there can be no question that *D. Beckleri* is not a variety of *D. striolatum*, but is a very distinct species of different habit.

15. *D. Tofftii* Bail. in 3rd Suppl. to *Synopsis Q. Fl.* (1890), et in *Q. Fl.* 1524; Fitzg. ined. No. 33; *A.O.R.* Dec., 1941, 82. This very beautiful species is confined to swampy forests along the coastal belt of North Queensland.

Having thus cleared the ground by indicating excluded species, and by enumerating those which, for reasons stated above, we do not propose to discuss further, we are now in a position to proceed with our review of the remaining 40, viz.:

<i>D. Adae</i>	<i>D. dicuphum</i>	<i>D. Keffordii</i>	<i>D. Schneiderae</i>
<i>agrostophyllum</i>	<i>falcrostrum</i>	<i>Kestevenii</i>	<i>Smilliae</i>
<i>aurantiaco-</i>	<i>Fleckeri</i>	<i>Kingianum</i>	<i>speciosum</i>
<i>purpureum</i>	<i>fuscum</i>	<i>lichenastrum</i>	<i>superbiens</i>
<i>Beckleri</i>	<i>Gouldii</i>	<i>linguiforme</i>	<i>tenuissimum</i>
<i>bifalce</i>	<i>gracilicaule</i>	<i>luteocilium</i>	<i>teretifolium</i>
<i>bigibbum</i>	<i>gracillimum</i>	<i>Mortii</i>	<i>tetragonum</i>
<i>canaliculatum</i>	<i>Grimesii</i>	<i>ophioglossum</i>	<i>undulatum</i>
<i>caneroides</i>	<i>Hollrungii</i>	<i>Phalaenopsis</i>	<i>variabile</i>
<i>Carrii</i>	<i>Johannis</i>	<i>Prenticei</i>	<i>Wilkinsonum</i>
<i>delicatum</i>			

16. *D. ADAE* Bail. in *Proc. R.S.Q.*, i (1884), et in *Q. Fl.* 1539; Rupp in *Q. Nat.* May, 1945, Plate vi, et *ibid.*, May, 1946, 12. This dainty species, with creamy-white flowers, tomentose labellum, and an exquisite perfume, deserves more attention from orchid growers than it has yet received. Though a native of tropical Queensland, it thrives and flowers well under ordinary bush-house conditions, as far south as Sydney. Recently it was the subject of an article by Rupp (see last citation above) suggesting that it is a dimorphic species. In the preceding year the writer had described what he believed to be an allied (but distinct) species from Mount Spurgeon, in the Mossman area of North Queensland, under the name *D. ancorarium*—in allusion to a curious anchor-like device at the foot of the column (*Q. Nat.*, May, 1945). The flowers were pale-green and scentless, and the labellum was glabrous. Next year this plant (a young one) bore two racemes. In one the flowers were almost exactly as described for the new species; but in the other, which opened later, they were in every respect typical flowers of *D. Adae*. It is for this reason that we have put *D. ancorarium* into our list of excluded species. We should be glad to hear from anyone who has observed this peculiarity in connection with *D. Adae*.
17. *D. AGROSTOPHYLLUM* F. Muell. *Fragm.* viii (1872), 28; Benth. *Q. Fl.* 1529; Krzl., *Pflanz.* 158; Fitzg. *A.O.* ii, 3. This is one of the few instances where Fitzgerald's plate does scant justice to its subject. It shows half-closed flowers of a dull and unattractive yellowish tint, and it would appear that his specimen was in very poor condition. Actually the flowers expand widely, and are a brilliant canary-yellow. The labellum is relatively large, and very conspicuous in the fully-expanded flower. Though the individual flower is small, the bright colour of the racemes, and their pleasing perfume, make this quite an attractive species. Like *D. Adae*, although a native of tropical Queensland, it is amenable to ordinary bush-house conditions in much cooler climates. (Text-fig. 1.)
18. *D. AURANTIACO-PURPUREUM* Nicholls in *N.Q. Nat.*, March, 1942. This is one of several very diminutive North Queensland orchids which present peculiar difficulties to the taxonomist. All are closely related, and all seem to be very near the hypothetical borderline separating *Dendrobium* from *Bulbophyllum*. Two of them, *D. lichenastrum* and *D. Prenticei*, were described by Mueller as species of the latter genus, although in the case of *D. lichenastrum* he evidently suspected that it might be a *Dendrobe*. Fitzgerald, in *A.O.* ii, 5, figures a plant over the name *B. lichenastrum*, which is quite irreconcilable with Mueller's type specimens in the Melbourne Herbarium. Nicholls, in an attempt to clarify the position of these small orchids in *N.Q. Nat.*, Sept. and Dec., 1938, identified the plant of Fitzgerald's plate with an undescribed

species which he had received from North Queensland, and which he named *D. variabile*. Subsequently, however, a different plant was sent to him, which he considered to be definitely that figured by Fitzgerald; and to this he gave the name of *aurantiaco-purpureum*. While we do not question this later determination, and agree with Nicholls in placing these plants in *Dendrobium*, we must confess to a hope that he will give us a revision of his exposition of the whole group, for we find it very difficult, in examining living material, to distinguish between his species. Moreover, we do not think he was justified in making the absence of a definite pseudobulb a ground for deciding against *Bulbophyllum* as the proper genus for these plants. The Himalayan *B. hymenanthum* Hook. and *B. gracilipes* King and Pantl.; the Malayan *B. botryophorum* Ridl. and other species that could be cited, are quite bulbless. Our agreement with his decision in favour of *Dendrobium* is based upon the floral characters rather than upon the habit of the plants. (Text-fig. 3, A.)



Text-fig. 1.—*Dendrobium agrostophyllum*. Inset (right): Upper surface of labellum (enlarged).

Text-fig. 2.—*Dendrobium Keffordii*. A. A lateral sepal (enlarged) twisted in the corkscrew form described in the text. B. Two flowers a few hours after expansion. C. Upper surface of labellum (enlarged). D. A plant (reduced).

Text-fig. 3.—Flowers of four diminutive north Queensland species of *Dendrobium* (side view, front view, upper surface of labellum shown for each species. All figures enlarged).

A. *D. aaurantiaco-purpureum*. B. *D. lichenastrum*. C. *D. variable*. D. *D. Prenticei*. (After plates by W. H. Nicholls.)

19. *D. BECKLERI* F. Muell. *Fragm.* v (1865), *nomen et ibid.*, vii (1869), 59; Fitz. *A.O.* i, 7; Bail. *Q. Fl.*, 1534; *Orch. N.S.W.*, 120. Bentham suppressed this species, but as Fitzgerald and others have pointed out, he evidently misinterpreted the material available to him. Actually he describes *D. Beckleri* under the name *D. Mortii*, q.v. *D. Beckleri* is a very well-marked species, the principal of those popularly called "Pencil Orchids", from the shape of their leaves. A form with mauve flowers has been recorded in northern N.S.W.

The species is found chiefly in open forest country, from the Hunter Valley in N.S.W. northward into the Queensland tropics.

Var. *racemosum* Nicholls in *N.Q. Nat.*, June, 1936. A North Queensland form with a very definite racemose inflorescence. In the type form, although the flowers are numerous, they are solitary.

20. *D. BIFALCE* Lindl. in *Journ. Bot.* ii (1843), 237; Krzl., *Pflanz.* 252; Rupp in *N.Q. Nat.*, Sept., 1945. White admits this as an Australian plant from its occurrence on the island of Saibai, politically part of Queensland, but geographically belonging rather to Papua. However, it was collected by R. L. Hunter in June, 1945, in the Portland Roads area north of Cairns. It is surprising that so conspicuous a species remained undiscovered on the mainland for so long. It has a wide range of habitat, extending from New Guinea to Fiji, where the type was found. A fuller description than Lindley's is given in *N.Q. Nat.*, loc. cit.
21. *D. BIGIBBUM* Lindl. in Paxton, *Flower Garden*, iii, 25 (1852), fig. 245; Krzl., *Pflanz.* 260; Benth. 277; Bail. *Q. Fl.* 1523; Fitzg. *A.O.* ii, 5; *Orch. Alb.* I, t. 38 (1882); *Bot. Mag.*, t. 4898.

We find it necessary to associate with this species No. 44, *D. PHALAEOPSIS* Fitzg. in *Gard. Chron.* (1880), ii, 38, et *ibid.* (1886), ii, 556, fig. 110, et in *A.O.* i, 7; Krzl., *Pflanz.* 261; *Orch. Alb.* iv (1885), t. 187; *A.O.R.* March, 1938 (frontispiece). We have given much time and thought to the vexed problem of the relations between these beautiful North Queensland orchids. We realize that the conclusion we have at last reached will probably be unacceptable to some of our readers, and that it will disappoint many who have been anxious to see a concise and clear statement of the distinctions between the numerous varieties (of both *D. bigibbum* and *D. Phalaenopsis*) which from time to time have been recorded. But we have become convinced that Bailey was entirely correct, from the botanical standpoint, when he reduced Fitzgerald's *D. Phalaenopsis* from specific rank to the status of a variety of *D. bigibbum* (*Q. Fl.*, loc. cit.). We may assume, we think, that Fitzgerald has faithfully depicted the typical *D. Phalaenopsis* in *A.O.* i, 7, and the typical *D. bigibbum* in *A.O.* ii, 5. No one examining these plates can deny that there are differences between the two orchids figured there; *but are they in any respect more important* than those which distinguish type from variety in scores of other species? Lest this be thought too vague a comparison, take two of our own Australian species of this same genus, viz., *D. teretifolium* and *D. tetragonum*. In what particulars are the differences between *D. bigibbum* and *D. Phalaenopsis* more striking, or more important botanically, than those between the typical *D. teretifolium* and its tropical variety *fasciculatum*? or those between the little sober-hued flower of the typical *D. tetragonum* and the large and colourful flower of var. *giganteum*? Even in their recognized varieties, *D. bigibbum* and *D. Phalaenopsis* seem to approach one another. White's var. *compactum* is generally considered a very distinctive form of the latter; but in what respects does it differ from Reichenbach's *D. bigibbum* var. *superbum*?

Generally speaking, the flowers of *D. Phalaenopsis* are superior, both in dimensions and in depth of colour, to those of *D. bigibbum*. But size and colour cannot be made the criteria for specific separation. It is the morphology of the flower which counts most; and we are satisfied that the structural differences between the flowers of these plants are very slight, and even at their best, are not of much botanical importance. Differences in dimensions, colour-scheme, and precise shade of colour itself may conveniently be used to denote the distinctive appearance they give to this or that variant from the typical form; but not to establish new species. If this point of view is not accepted, why should we not split both *D. bigibbum* and *D. Phalaenopsis* into still more species? The differences between the typical *D. Phalaenopsis* (the "Cooktown Orchid", as it is called) and its variety *Rothschildianum*, or the new variety *W. Parton*, seem to us greater than those which are supposed to distinguish it from *D. bigibbum*. We follow Bailey in regarding *D. Phalaenopsis* as a large and beautiful form of *D. bigibbum*, itself even more subject to variation than the species proper; and we think that its named varieties should be reduced to sub-varieties. We may be accused of inconsistency in holding these views, yet still retaining both names in our list of species. We do this because we recognize that the *bigibbum-Phalaenopsis* problem is a very difficult one, and that

others who are as well qualified to judge as we are, may uphold the view that here are two distinct species. We are unable to endorse the view ourselves.

We do not think that in a review such as this we can enter into a discussion of the many varieties which have been published in connection with *D. bigibbum* and *D. Phalaenopsis*. Most of them are based on differences in the colour-scheme of the flowers; in a few there are other distinctions, such as dwarf and compact habit, etc. These variations are chiefly of interest to orchid growers, and would be more appropriately discussed in a journal exclusively devoted to orchid cultivation. We may add that in any such discussion we think a third species, *D. dicuphum* F. Muell., should receive some consideration. At least one form of this species approaches very closely *D. bigibbum* var. *candidum*.

D. bigibbum is found chiefly in the Cape York Peninsula, but is occasionally seen a good deal to the south of that area. The vernacular name so commonly used for var. *Phalaenopsis*—"Cooktown Orchid"—gives the clue to its principal habitat, though it is by no means exclusively confined to the Cooktown district. With its large purple flowers, usually shading to deep mauve on the labellum, it is one of the most beautiful of all Australian orchids, and can hold its own even among the most highly valued species of exotic origin.

22. *D. CANALICULATUM* R. Br. 333; Benth. 282; Bail. *Q. Fl.* 1530; Fitzg. *A.O.* i, 3; *Bot. Mag.* 5537 (as *D. Tattonianum*). Syn. *D. Tattonianum* Bateman in *Gard. Chron.* (1865), 890. Another very attractive species from North Queensland, extending to the Northern Territory. It is far more variable than the descriptions indicate, although Bailey in a footnote remarks, "colouring and marking very variable". The contour of the labellum is remarkably inconstant, ranging from almost orbicular to elongate-rhomboid. The general habit of the plant is also variable. In the commonest form the pseudobulbs are very short and greatly swollen, prompting the vernacular name "Onion Orchid"; but sometimes they are longer and not conspicuously swollen. The leaves, too, are sometimes very thick and deeply channelled, sometimes very slender and almost terete, with only an obscure median channel. In 1882 Mueller, in *Wing's S. Sci. Rec.*, p. 230, described a Dendrobe from the Northern Territory as *D. Foelschei*. He remarked upon its affinity with *D. canaliculatum*, but thought that it merited specific rank. By the courtesy of the authorities of the Victorian National Herbarium, we have been able to examine flowers of the type specimen. We think Kranzlin was right (*Pflanz.* 274) in reducing *D. Foelschei* to a form of *D. canaliculatum*; although W. H. Nicholls is inclined to support Mueller. But the flowers differ no more strikingly from the typical *D. canaliculatum* than do others generally accepted as only variants. Since, however, this plant appears to combine several variations, we think it may be retained as a named variety.

Var. *Foelschei*, n. var. (*D. Foelschei* F. Muell., loc. cit.). Pseudobulbs not swollen, or slightly fusiform; leaves very slender, nearly terete. Flowers smaller, or at least more attenuated, than in the type, the mid-lobe of the labellum more or less rhomboid—Northern Territory. (Flowers of a plant collected by R. J. Langdon (of Adelaide), near Darwin, appear to belong to this form, though the floral segments are longer than in Mueller's plant.)

Var. *nigrescens* Nicholls in *A.O.R.* Sept., 1942, frontispiece and p. 40. Perianth-segments pale green towards the base, deep sepia-brown above; labellum white with the usual purple markings. Locality doubtful. This seems to be the form recorded on the Cape York Peninsula by Dr. H. E. Young in *A.O.R.*, March, 1947.

23. *D. CANCROIDES* Hunt in *N.Q. Nat.*, June, 1947. This is a recent discovery by J. H. Wilkie in the Bellenden Ker Range, North Queensland. As in the case of *D. bifalce*, it is surprising that so large and distinctive a species should have escaped detection for so long. The curious, reddish-brown flowers, which do not expand widely, somewhat resemble small crabs. The species seems to be closely related to the New Guinea *D. Gjellerupii* J. J. Sm.; its nearest Australian relative is *D. luteocilium* Rupp.

24. *D. CARRII* Rupp and White in *Q. Nat.* March, 1935, 61, and Feb., 1942, 19. A small plant with the habit of *D. monophyllum*, F. Muell., but the pseudobulbs are never crowded, and the flowers are white or cream, with narrow sepals and petals; lateral lobes of the labellum splashed with red, mid-lobe yellow. Mount Spurgeon, on the main coast range behind Mossman, north Queensland.
25. *D. DELICATUM* Bail., *Q. Fl.* 1527; Krzl., *Pflanz.* 271; Rupp, in *Q. Nat.* March, 1935, 61; Weinthal in *A.O.R.* June, 1939. Syn. *D. speciosum* Sm. var. *delicatum* Bail. in *Proc. R.S.Q.*, i (1884). Probably few Australian orchids have been subjected to more argument and discussion than this. For those who wish to follow the inquiries into its identity, its status, and its relation to *D. Kestevenii* Rupp, we cite the following additional references: these PROCEEDINGS, lviii, Parts 3, 4 (1933), 223; *A.O.R.*, Dec., 1939, 124; Rolfe in *Orch. Rev.*, April, 1908. An admirable photograph will be found in *A.O.R.*, March, 1940, p. 20.

It now seems practically certain that the origin of *D. delicatum* lies in natural hybridization between *D. speciosum* and *D. Kingianum*. The English experiment in crossing these, mentioned by Rolfe, i.c., was not accepted in Australia as conclusive, because there was some doubt whether English botanists had not previously mistaken the white-flowering form of *D. Kingianum* for *D. delicatum*. But more recently this experiment was repeated by Dr. H. E. Young of Brisbane, and the resulting hybrid cannot be distinguished from *D. delicatum*. In the wild state, however, the latter is a very variable plant, and several of the forms may have originated independently (*A.O.R.* Dec., 1939, i.c.). But, granted the hybrid origin of *D. delicatum*, does this necessarily imply, as assumed by Rolfe, its disqualification as a species? If so, then there must be thousands of other plants whose specific rank rests solely upon the fact that their hybrid origin lacks the demonstration which has been given in this case—surely a rather precarious foundation. Lotsy long ago showed us what a large part hybridization has played in the evolution of species. If a natural hybrid is established independently of its "parents", and reproduces itself without exhibiting the slightest tendency to revert to the character of either parent, surely it is entitled to specific rank.

A very curious point in connection with *D. delicatum* is the limited area of its habitat. It was first found on the main Dividing Range near Toowoomba; more recently it has been collected or recorded in a few other southern Queensland localities. Now *D. speciosum* and *D. Kingianum* occur together, often in abundance, along the whole coastal belt of northern New South Wales for several hundred miles. Yet no plant suggesting hybridization between them has been found on the New South Wales side until Bullahdelah is reached, some 350 miles in a direct line from the *delicatum* area. Diligent search has been made in many localities, without result. At Bullahdelah a plant which somewhat resembles *D. delicatum*, and is probably of similar origin, was discovered some years ago, and received the name *D. Kestevenii*. Why neither of these plants should occur in that long gap between them is something of a mystery.

26. *D. DICUPHUM* F Muell. *Fragm.* viii (1872), 28; Benth. 277; Rupp and Nicholls in *N.Q. Nat.* Sept., 1943. A common species in the Northern Territory and recorded by Gardner in the N.W. of Western Australia. The plate by Nicholls in *N.Q. Nat.* shows the typical form; but another was collected (independently) by G. L. Piper of Brisbane and R. J. Langdon of Adelaide, when on active service in the Territory. We are naming this var. *grandiflorum*, but we confess we can see little to distinguish it from *D. bigibbum* var. *candidum*. Undoubtedly *D. bigibbum* and *D. dicuphum* are closely allied; but as no other form of *bigibbum* is recorded from the *dicuphum* area, we attach this variety to the latter.

Var. *grandiflorum*, n. var. *Flores majores, nivei*. Flowers half as large again as those of the type form, pure white.

27. *D. FALCOROSTRUM* Fitzg. in *S.M.H.*, Nov. 18, 1876, et *A.O.* i, 5; *Orch. N.S.W.*, 116; see also *A.O.R.*, March, 1937, 17; *ibid.*, Dec., 1937, 11. This beautiful species is

well known to orchid growers under the name "Beech Orchid". Questions in regard to its habitat are frequently raised, and we are prepared to give a definite answer. It has never been found except in forests of the Antarctic or Negrohead Beech (*Nothofagus Moorei*). The southern limit of this tree is on the south side of the fall from the Barrington Tops plateau, some 60 miles N. of Newcastle, New South Wales. It occurs again about Dorrigo, on the eastern side of New England, and extends sparingly from there to the Lamington National Park in the Macpherson Ranges of southern Queensland. It is rarely seen at an elevation of less than 3,000 ft. Before the march of settlement had destroyed the greater part of the Dorrigo beech forests, *D. falcorostrum* grew there literally in thousands; today it is in danger of extinction. Although it is confined to the beech forests, within them it occurs on other trees besides the beeches, being often found on the Mountain Wattle (*Acacia elata*). It is easily cultivated, and as a rule blooms most prolifically. Being a large and robust plant, it makes a fine display with its masses of snowy white flowers, which are intensely fragrant during the warmer hours of the day. We have seen plants bearing over 100 racemes.

28. *D. FLECKERI* Rupp and White, *Q. Nat.*, Feb., 1937; Rupp in *N.Q. Nat.*, Dec., 1937. A very dainty species from the Upper Mossman River jungle near Mount Spurgeon, north of Cairns. When not in bloom, the plant might easily be mistaken for *D. Adae*, though less robust; but the flowers are very different. They are of moderate size, and of a rich apricot colour; the labellum is densely pubescent, with purplish-red markings. Like *D. Adae*, this species is quite amenable to ordinary bush-house conditions, even in much cooler climates than that of its native habitat.
29. *D. FUSCUM* Fitzg. in *S.M.H.*, Sept. 24, 1879, et *Gard. Chron.* (1879), II, 680; also Fitzg. ined. No. 83. Fitzgerald's locality note merely gives "North Queensland". The species has been collected by J. S. Edgar at Port Denison. It is apparently rare. A robust plant up to 90 cm. high, with slightly fusiform stems bearing leaves on the upper portions only. Flowers about 12; sepals about 2 cm. long, red-brown with lighter edges, not undulate; petals longer, darker, undulate in the upper half; labellum half as long as the petals, linear, lateral lobes incurved, mid-lobe minute, longitudinal calli of the disc 5. The species appears to be closely related to *D. undulatum* R. Br.
30. *D. GOULDII* Rchb. f. in *Gard. Chron.* (1867), 901, et in *Xen.* ii, 167, t. 169; J. J. Sm. in *Nov. Guin.* viii, 67, t. xxiii; Krzl., *Pflanz.*, 155. Little is known of this species in Australia. Reichenbach's description is meagre. He records a variety, var. *acutum*, and it is this which is believed to be an Australian plant; but J. J. Smith, who gives the record "Thursday Island" for the species, says nothing of the variety. Reichenbach merely says that *D. Gouldii* is one of the numerous "Polynesian" discoveries of John Gould Veitch, in whose honour he named it. In the Sydney Herbarium there is a specimen, collected by someone unknown at Thursday Island in 1897, which Rupp considers to be this species, though he found it labelled *D. Johannis*. The flowers are much larger than those of the latter, and the labellum agrees almost perfectly with Smith's figure, loc. cit.
31. *D. GRACILICAULE* F. Muell. *Fragm.* i (1859), 179; *A.O.R.*, Sept., 1940, 72; Fitzg. ined. Nos. 22, 23. Syn. *D. elongatum* Cunn. (not of Lindl.); *D. brisbanense* Rchb. f. Formerly very common in many coastal forests of N.S.W., but now chiefly found north of Port Jackson. Extends to tropical Queensland; also in Lord Howe Island. The plant varies in height from 25 to 90 cm. Stems very slender. Racemes short, in the type form with small, fragrant yellowish flowers more or less blotched outside with red-brown.

Var. *Howeanum* Maiden in these PROCEEDINGS, Part 3 (1889), 382. This is the Lord Howe Island form; but some years ago a plant apparently identical with it was collected by Dr. C. H. Jaede at Mangrove Mountain near Gosford, N.S.W. The flowers are a rich creamy-yellow without any blotches; they have a different perfume; and there is a greater development of leaves.

32. *D. GRACILLIMUM* Rupp, *Vict. Nat.* lxi (1945), 200. Syn. *D. speciosum* Sm. var. *gracillimum* Rupp in these PROCEEDINGS, liv (1929), 550, et *Orch. N.S.W.*, 114; *A.O.R.* June, 1940, 63. This plant resembles a very robust *D. gracilicaule*, but the flowers are far more like those of *D. speciosum*, except that the perianth-segments are barely half as long as in the latter. In all probability it originated as a natural hybrid between these species. Flowers vary in colour from white through cream to deep yellow. It is thought that the white-flowered form may be identical with Bailey's *D. speciosum* var. *nitidum* (*Proc. R.S.Q.*, i (1884)), and a further suggestion has been made that Rendle's *D. Jonesii* (see No. 2 above) is the same plant. Bailey gives "Tropical Queensland" as the habitat of his var. *nitidum*. Nothing resembling it has been seen by us from that area, although it has been looked for. But his description does agree fairly with the white *D. gracillimum* of southern Queensland and northern N.S.W. Unfortunately there are no certified specimens of var. *nitidum* in existence. Rendle's *D. Jonesii* was named from a plant sent to England from Innisfail in North Queensland, which flowered in Surrey in 1899. His description agrees very well with the cream-flowered *D. gracillimum*. But we have seen no plant from tropical Queensland which could possibly be determined as this species. We do not question the occurrence of either *D. speciosum* var. *nitidum* or *D. Jonesii* in the areas recorded by Bailey and Rendle; but we think actual specimens are required in order to determine whether they are identical with each other and with *D. gracillimum*. Until this point is settled, the last-named species must be allowed to stand.
33. *D. GRIMESII* White and Summerhayes in *Kew Bulletin* No. 3, 1934, p. 106. The affinities of this rare species are with *D. teretifolium* R. Br., to which it bears a considerable resemblance. The leaves are thicker, and the floral characters differ in important respects. The sepals and petals are shorter, and the former are 3-nerved, not 5-nerved. The mid-lobe of the labellum is marked by 5 sub-parallel longitudinal veins, but is completely devoid of lateral veins at right angles to them. The species has only been found at Lake Barrine on the Atherton Tableland, in north Queensland.
34. *D. HOLLRUNGII* Krzl. in Schumann and Hollrung, *Fl. Kais. Wilh. Land* (1889), 32. The only form in which this plant is known to occur in Australia is var. *australiense* Rendle, *Journ. Bot.* xxxvii (1899), 339. Rendle's type was collected at Innisfail, north Queensland, and sent to England, where it flowered at Ewhurst, Surrey, in 1899. In 1946 Hunt received a plant collected by Mrs. Eunice Kirkwood at El Arish, Cairns district, which flowered in October. This is the only record since Rendle's description was published. *D. Hollrungii* is closely related to *D. Smilliae* F. Muell., and the Australian form may perhaps have been occasionally mistaken for that species. The flowers are a dead, waxy white, tipped with shining green, and having some crimson markings on the column. They are in a conical cluster on short, erect racemes. Bailey mentions Rendle's variety in his "Comprehensive Catalogue of Queensland Plants", 1909. We include this plant under the name given to it by Rendle; but we venture to suggest that further investigation may show the desirability of transferring it to *D. Smilliae*. So far as we can judge, there is nothing in its character which would debar it from inclusion within Mueller's species; and it seems to us far more likely that it had its origin in variation from this Australian orchid (which occurs in the same area), than from a species of an area in the north-western parts of New Guinea.
35. *D. JOHANNIS* Rchb. f., *Gard. Chron.* 1865, 890, et *Xen.* ii, 165; Benth. 279; Bail. *Q. Fl.* 1525; *Bot. Mag.* t. 5540. This species is obviously related to *D. undulatum* R. Br., but is a much smaller plant. It varies considerably, but so far as we know only one variety has been named. In a form from the Torres Strait islands represented in the N.S.W. National Herbarium, the perianth segments are relatively very broad; and a specimen in Rupp's collection there, collected by Goadby near Cairns (possibly in cultivation), has very large flowers. The typical form is multi-coloured;

a rich brown is predominant, but yellow, green, and red tints are frequent. The species is found chiefly in the far north of Queensland along the Cape York Peninsula, extending to the Torres Strait islands.

Var. *semifuscum* Rehb. f., *Gard. Chron.* 1883, 268. Petals pale brown. Cooktown, north Queensland.

36. *D. KEFFORDII* Bail., *Proc. R.S.Q.* i (1884), et *Q. Fl.* 1530. The opinion has been expressed by some botanists that this plant and *D. Baileyi* F. Muell. are conspecific. As indicated above, we have not been able to obtain specimens of *D. Baileyi*, and are therefore not in a position to state any view of the relations between these two. But we wish to point out: (1) that Bailey himself discovered the plant which Mueller, in 1874, named after him; and (2) that Bailey named and described *D. Keffordii* ten years later. We think it extremely unlikely that a botanist of his calibre could be so forgetful of the plant which bore his own name, as to describe it under another name.

A fine plant of *D. Keffordii* was received by Rupp in 1946 from Cape Tribulation, 50 miles north of Cairns (coll. W. W. Mason Jun.). It flowered in February, 1947, and from the observations made since its arrival, we submit the following description supplementary to that given by Bailey. (Text-fig. 2.)

Stems of wiry texture, no thicker than that of a fishbone fern (*Nephrolepis*), numerous. Leaves linear-lanceolate, unequally and very minutely emarginate at the tips; dimensions very variable, but those given by Bailey are rather above the average. Flowers in pairs, yellowish-green outside with a few dark spots or streaks, inside densely speckled with dark reddish-purple dots; perianth segments all filiform, the newly opened flowers resembling those of *D. tetragonum* var. *Hayesianum*. Disc of the labellum with a single rather broad longitudinal callus, more or less channelled along the lower portion, widening about the junction of the lateral lobes, and almost covering the surface of the mid-lobe inside its fringed margins, but not reaching the apex. Within a few hours after the expansion of the flowers, the filiform sepals and petals begin to curve inwards and to twist like miniature corkscrews, finally becoming entangled round the labellum and column. The flower remains alive in this curious tangle for several days before withering. In none of the flowers observed was the process just described due to pollination, for every anther remained intact throughout. Is it possible that in its native habitat the flower is quickly visited by some pollinating agent, and has developed this tangling process to prevent further interference with the gynostemium? It may reasonably be objected that if the flower is *not* pollinated, the stimulus required for the process would be lacking. But what other explanation can be suggested?

D. Keffordii is found in the mangrove scrubs of the North Queensland coast. Kranzlin, in *Pflanz.* 174, gives as a synonym *D. Armitiae* Bail. (*Q.A.J.* iv (1899), 48); but we cannot endorse this. Bailey's description of *D. Armitiae*—from New Guinea—implies floral characters which we regard as irreconcilable with those of *D. Keffordii*.

37. *D. KESTEVENII* Rupp, in these PROCEEDINGS, lvi (1931), et *ibid.*, lviii (1933), 223, et in *Orch. N.S.W.*, 114, et in *A.O.R.*, Dec., 1939, 124. Reference has already been made to this species under *D. delicatum*, to which it is obviously closely allied. The pseudobulbs of *D. Kestevenii* are more consistently robust, and of a paler green; the racemes are stronger and more erect; and the flowers do not expand so widely. The only named variety has no counterpart in the variations from the type of *D. delicatum*. Both species and variety appear to be confined to the Bullahdelah district, north of Port Stephens, N.S.W.

Var. *coloratum* Rupp, in *Orch. N.S.W.*, l.c. Stems dwarf, very crowded, curved. Flowers mottled and suffused with rosy pink. Petals almost acuminate.

38. *D. KINGIANUM* Bidw. in Lindl., *Bot. Reg.* (1844), Misc. 11; *ibid.* (1845), t. 61; *Bot. Mag.* 4527; Benth. 280; Bail. *Q. Fl.* 1528; *Orch. N.S.W.*, Plate xx. This variable species is favoured by growers for its bright colour, its pleasing perfume, and its

easy cultivation. It is essentially a rock orchid, growing freely, often in extensive masses, on ledges or in crevices of cliffs, or sometimes covering the whole face of a rock. In view of its hardy nature and its abundance in many localities, its range of habitat is surprisingly restricted. We have no definite record of its occurrence south of Port Stephens in N.S.W. From there it extends northward as far as the Glasshouse Mountains in southern Queensland. The plants vary greatly in dimensions, often exceeding 40 cm. in height, but just as often reaching only 12 cm. Flowers on the dwarf plants are as large as those of the tall form. They vary in colour from pure white (rare) through several shades of pink and purple, to deep mauve. The named varieties are:

Var. *pallidum* Bail. in *Proc. R.S.Q.* i (1884). Stems weak, up to 22 cm. high. Racemes with very pale lilac flowers.

Var. *Silcockii* Bail., *Q. Fl.*, l.c. Stems robust, light green, up to 35 cm. high. Flowers white with a purple labellum.

Var. *Aldersoniae* Bail. in *Q.A.J.* xv (1905), 781. Flowers white, pale purple spots on the sepals, and pale purple labellum.

Var. *pulcherrimum* Rupp in *Orch. N.S.W.*, 116. Stems crowded, usually dwarf but robust; flowers deep mauve.

D. Kingianum exhibits a tendency to produce aerial growths more freely than any other Australian species. These often flower before dropping from the parent plant. The form with pure white flowers is generally regarded as an albino. It occurs sporadically wherever the species is found, and has occasionally been mistaken for *D. delicatum*, but the latter is a much larger plant, with pink tints in the flowers.

We cannot agree with Kranzlin in reducing *D. subquadratum* J. J. Sm. to a variety of *D. Kingianum* (*Pflanz.* 274). Not only is it extremely unlikely that a variety of the latter should occur in New Guinea, more than 1,500 miles from the Glasshouse Mountains; but the floral details of *D. subquadratum* as shown by Smith in *Nov. Guin.* viii are very different from those of *D. Kingianum*.

39. *D. LICHENASTRUM* F. Muell. *Fragm.* vii (1869), 60 (nomen); Krzl., *Pflanz.* 289; Nicholls in *N.Q. Nat.*, Sept. and Dec., 1938. Syn. *Bulbophyllum lichenastrum* F. Muell. *Fragm.*, l.c.; Bail. *Q. Fl.* 1537. Mueller had apparently placed this diminutive plant first in *Dendrobium*, but he described it as a *Bulbophyllum*. Kranzlin places it in *Dendrobium*. Following is a free translation of his remarks: "As Ferd. Mueller rightly suspected, it is more satisfactory to ascribe this little plant to *Dendrobium*. The form of the labellum is perhaps, after a fashion, similar to that of *Bulbophyllum*, nevertheless it is not the same. Except for the labellum, all the characters indicate the section *Strongyle*" (i.e., in *Dendrobium*). Nicholls was apparently not aware of Kranzlin's treatment of the plant when he transferred it to *Dendrobium* in *N.Q. Nat.*, l.c. His figures of the floral details show close affinity with his own *D. aurantiaco-purpureum*, but the leaves are very different. There can be no doubt, as Nicholls states, that Fitzgerald misinterpreted Mueller's *Bulbophyllum lichenastrum*. The specific name is remarkably apt, and a patch of this tiny plant growing on a rock might easily be mistaken for a lichen or a liverwort. On the other hand, there is no such resemblance in the plant depicted by Fitzgerald. *D. lichenastrum* is probably the smallest known species of the genus. The creeping rhizomes form dense patches on trees or rocks, and are concealed by the very numerous, thick leaves, barely 1 cm. in length, and often as broad as long. The diminutive solitary flower, on a relatively long pedicel, is whitish with branching red lines, and an orange labellum. The species is not uncommon about the Bellenden Ker Range and the Atherton Tableland in North Queensland. (Text-fig. 3, B.)
40. *D. LINGUIFORME* Sw. in *K. Akad. Stockh. N. Handl.* (1800), 247; *Sm. Ex. Bot.* I (1804), t. 11; Rupp, illustr. in *Guide to Orch. N.S.W.* (1930), 31. This was the first Australian *Dendrobe* to be described. The author, Swartz, was also the founder of the genus. *D. linguiforme* was named from its thick, tongue-like leaves. It creeps, often in large masses, on rocks or trees, and is common in many districts of eastern

Australia from southern N.S.W. to tropical Queensland. The short racemes of densely set white flowers are very attractive. A yellow-flowering form has been recorded in northern N.S.W. (Fordham, at Brunswick Heads), but has not been named.

Var. *Nugentii* Bail. *Q. Fl.* 1533. A north Queensland form with almost rotund leaves and smaller flowers.

Var. *Huntianum* Rupp in *A.O.R.* Sept., 1942, 40. A form from the Upper Brisbane River, Queensland, blooming two to three months earlier than the type form. Leaves often very long; inflorescence approaching that of var. *Nugentii*. In continued cultivation this variety shows a tendency to revert to the type form.

41. *D. LUTEOCILIUM* Rupp in *N.Q. Nat.*, Dec., 1945. This species was discovered at Babinda, North Queensland, by J. H. Wilkie in October, 1945. It seems to be closely related to several New Guinea species described by Schlechter in Fedde, Rep. i (1914), 573-618, but is sufficiently distinct for specific rank. A rather tall plant with leafy, somewhat flattened stems. Flowers a little more than 2 cm. in diameter, in pairs, yellowish-green, very fugacious. Labellum with a conspicuous patch of yellow cilia near the apex of the mid-lobe. (Text-fig. 4.)
42. *D. MORTII* F. Muell. *Fragm.* i (1858), 214; Rupp in *Q. Nat.*, August, 1934, 51, et in *A.O.R.*, Sept., 1941, 57. Syn. *D. Bowmanii* Benth. 286. Bailey correctly describes this species in *Q. Fl.* 1534, but then strangely proceeds to a description of Bentham's *D. Bowmanii*, which he distinguishes from it. Bentham most evidently mixed up Mueller's specimens of *D. Beckleri* and *D. Mortii*; he suppressed the former, but described it as *D. Mortii*, and then established a new species, *D. Bowmanii*, from north Queensland specimens of *D. Mortii*. There is no appreciable difference between the northern and southern forms of this species. The leaves of the former are a trifle more robust, and the labellum is more obtuse. *D. Mortii* is one of the so-called "Pencil Orchids", allied to, but quite distinct from, *D. Beckleri* and *D. striolatum*. An interesting characteristic is its production of several "crops" of flowers in succession, from late January to April or May. It extends from about the Clarence River in N.S.W. northward into the Queensland tropics.
43. *D. OPHIOGLOSSUM* Rehb. f. in *Journ. Linn. Soc. London*, xv (1877), 113; Krzl., *Pflanz.* 135; C. T. White in *A.O.R.*, June, 1943, 19. It is difficult to give any satisfactory account of this species. It has been known only from a solitary specimen in Kew Herbarium, collected at Cape York in 1874 by H. N. Mosely of the "Challenger" Expedition. It was described by H. G. Reichenbach from this specimen. Kranzlin, l.c., stated that the specimen was in very bad condition; but he disagreed with Rolfe, who had expressed the opinion that it was identical with *D. Smilliae*. In *A.O.R.*, l.c., White published an article (illustrated by a very fine photograph) under the heading "Has *D. ophioglossum* been re-discovered?". The re-discovery, however, if such it be, is not in Australia, but in the Solomon Islands. A plant from there was successfully grown by C. A. Dunn in Brisbane. White admits certain differences in the floral details of this plant from those described by Reichenbach and Kranzlin; but it seems to us that these are such as might be accounted for by the difference between a damaged and long-dried specimen and a living flower. We think that White makes out a good case for the identity of the Solomon Islands plant. If he has interpreted it correctly, there can be no doubt that *D. ophioglossum* and *D. Smilliae* are distinct species. Habit and inflorescence are similar, but the individual flowers are quite different. The Solomon Island flowers appear to us to be nearer to those of the New Guinea *D. bracteosum*. It is to be hoped that *D. ophioglossum* will be found again in its type locality. Dr. H. E. Young, who contributes an article on the orchids of Cape York in *A.O.R.*, March, 1947, apparently saw no plant there which could be interpreted as this species.
44. *D. PHALAEANOPSIS* Fitzg. This has been dealt with above under *D. bigibbum*.
45. *D. PRENTICEI* (F. Muell.) Nicholls in *N.Q. Nat.*, Sept. and Dec., 1938. Syn. *Bulbophyllum Prenticei* F. Muell. in *Wing's S. Sci. Rec.*, 1881, 173. This is another of the

diminutive North Queensland orchids which Nicholls, l.c., places in *Dendrobium*. In allusion to this species he remarks, "It is difficult to assign this plant satisfactorily to either *Bulbophyllum* or *Dendrobium*", and then suggests that the absence of a pseudobulb should exclude it from the former genus; but we have already pointed out in connection with *D. aurantiaco-purpureum* that this argument is not sound. It might be urged with equal force that the lobeless labellum should exclude it from *Dendrobium*; but we cannot bind plants to hard-and-fast rules, and as there are species of *Bulbophyllum* without pseudobulbs, so there are species of *Dendrobium* with entire labella. For ourselves, we endorse Nicholls's transfer of this plant mainly on the ground of its very obvious close affinity with *D. aurantiaco-purpureum*, *D. lichenastrum*, and *D. variabile*. If, as we believe, these three are rightly assigned to *Dendrobium*, it would be absurd to place *D. Prenticei* in a different genus. Indeed, we do not feel sure that *D. aurantiaco-purpureum*, which appears to be the rarest of the plants in this group, might not with advantage be considered a sturdy variety of *D. Prenticei*. The morphological distinctions do not seem to be great. (Text-fig. 3, D.)

46. *D. SCHNEIDERAE* Bail. in *2nd Suppl. Synopsis Q. Fl.* (1888), 57, et *Q. Fl.* 1531. This small species, which is found in southern Queensland and northern N.S.W., might be mistaken for a depauperate form of *D. monophyllum*, but the pseudobulbs are smaller and the leaves are more often paired than solitary. The racemes are weak and drooping, with a few small yellowish flowers. The only known variety is a far more attractive orchid than the type form.

Var. *major* Rupp in *Q. Nat.*, Jan., 1939. Discovered in the Eungella Range, Mackay district, Queensland, by Dr. C. P. Ledward in 1937. Larger than the type form; racemes strong and erect, but gradually curving, up to 18 cm. long; flowers similar to those of the type, but from 12 to 25.

47. *D. SMILLIAE* F. Muell. *Fragm.* vi (1867), 94; Rehb. f. in *Gard. Chron.* (1886), II, 552; Benth. 282; Bail. *Q. Fl.* 1530. Syn. *Coelandria Smilliae* Fitz. *A.O.* i, 7. Fitzgerald thought this so unlike any species of *Dendrobium* with which he was acquainted that he established a new genus to accommodate it. His action, however, has not been endorsed. Quite a number of *Dendrobium* species share its peculiar form of inflorescence. It is closely related to *D. Hollrungii*, and in our note on that species we have suggested that Rendle's *D. Hollrungii* var. *australiense* might be transferred to the present species. *D. Smilliae* is a robust species up to 90 cm. high. The flowers are borne in small, densely-packed racemes; individually they are not large, but the racemes are often borne in great profusion. Reichenbach, l.c., gives a glowing description of the beauty of this orchid. The flowers are red, tipped with green. The individual flower is tubular above the spur, and the perianth segments are free only towards their apices. Capsules waxy-white. The species is not uncommon in North Queensland.
48. *D. SPECIOSUM* Sm. *Ex. Bot.* I (1804), 17, t. 10; Benth. 279; Bail. *Q. Fl.* 1526; Fitzg. *A.O.* ii, 4; *Bot. Mag.* 3704; *Orch. N.S.W.* 113; *A.O.R.* March, 1937, 7, et Sept., 1946, 65. Bentham remarks on the misrepresentation of the flowers in Sir J. E. Smith's plate; and indeed they are almost unrecognizable. Although this fine species, ranging from eastern Victoria northward into the Queensland tropics, is familiar to many people under the inappropriate vernacular name of "Rock Lily", it presents great difficulties to those who wish to see distinguishing names attached to its numerous varieties. Botanists have attempted to meet this demand, but with indifferent success, the variations being so often inconstant. Three forms which were originally described as varieties of *D. speciosum* are now recognized as species, viz., *D. fusiforme*, *D. delicatum* and *D. gracillimum*. On the other hand, Hooker's *D. Hillii* is now only ranked as a variety of *D. speciosum* with tall stems and smaller individual flowers. Bailey, l.c., records three varieties—*Hillii*, *curvicaule* and *nitidum*—and two "forms" of var. *Hillii*—*Bancroftianum* and *grandiflorum*. Kranzlin (*Pflanz.* 271) identifies forma *Bancroftianum* with *D. delicatum*; but we cannot endorse this, as *Bancrof-*

tianum is described by H. G. Reichenbach as a plant with the robust habit of *D. speciosum*, the floral segments longer and narrower. Why Bailey placed his form *grandiflorum* under var. *Hilli* and not under the species itself is not clear. We have not seen his var. *curvicaule*; but from the description he gives, it would appear to merit more than varietal rank. His var. *nitidum* has been discussed in connection with *D. gracillimum* above, as it may prove to be the white-flowering form of that plant; but no specimens are known at present.

49. *D. SUPERBIENS* Rehb. f. in *Gard. Chron.* (1876), II, 516, et *ibid.* (1878), I, 40; Krzl., *Pflanz.* 258; Fitzg. *A.O.*, ii, 1; *A.O.R.* Dec., 1939, 111. This well-named species is considered by some botanists and growers to be of hybrid origin, *D. bigibbum* var. *Phalaenopsis* × *D. undulatum*. Bailey, in *Q. Fl.* 1524, distinguishes between it and Mueller's *D. Fitzgeraldii*, which he considers to be the subject of Fitzgerald's plate; but it is generally conceded that the two are synonymous. *D. superbiens* exhibits considerable variation in shades of colour between purple and red, and in some forms the segments of the flowers are more undulate, or even twisted, than in others. H. G. Reichenbach's *D. Goldiei* (see excluded species above) is a form of *D. superbiens* with deep purplish-red flowers and very slight undulation in the floral segments. Fitzgerald's splendid plate is an admirable representation of this very beautiful species as it is most commonly known to growers. We do not know of any definite record of its occurrence on the mainland of Australia, but it is found on the adjacent islands of Torres Strait. In Dr. H. E. Young's article on the orchids of Cape York already referred to (*A.O.R.* March, 1947), he does not mention seeing it on the Peninsula, though both of its putative parents were abundant there; but he found it on Prince of Wales Island.
50. *D. TENUISSIMUM* Rupp in these PROCEEDINGS, lii (1927), 570, et in *Q. Nat.*, August, 1934, 52. This dainty species is closely allied to *D. Mortii* and *D. Beckleri*, but could not be included in either. It was described from specimens found on the Upper Allyn River, in the southern foothills of Barrington Tops, N.S.W., but has been found since then in other localities, northward to the mountains of southern Queensland. It is discussed here chiefly to call attention to the fact—recorded in *Q. Nat.*, l.c.—that Mueller recognized it as a distinct species as far back as 1883, but never published it. This was not known to Rupp until seven years after he had described it.
51. *D. TERETIFOLIUM* R. Br. 333; Benth. 285; *Bot. Mag.* 4711; Bail. *Q. Fl.* 1533; Rupp in these PROCEEDINGS, lx (1935), 155; *A.O.R.*, June, 1943, 34. This species was discussed and reviewed at some length in these PROCEEDINGS, l.c., where a third variety was added to the two recorded by Bailey in *Q. Fl.* The type form, with white or pale cream flowers, is common in N.S.W. from the south coast northward to Byron Bay. There for the first time appears the yellow-flowering var. *aureum*, which becomes the dominant form in southern Queensland. Further north it disappears again and the north Queensland var. *fasciculatum* has white flowers, but in a strikingly different inflorescence. Var. *Fairfaxii*, for which Bailey seems to have mistaken this northern form, is now regarded in N.S.W. as the rain forest form of the species. Intermediates between it and the type form may often be found where rain forest meets open forest, but the latter is very rarely seen inside the rain forest. All the forms of *D. teretifolium* tend to produce giant and dwarf flowers. This habit, of course, is found in many other orchids, but it is certainly very characteristic of the present species. Even on the same tree, one plant may have flowers twice as large as those of its neighbours. Although the individual flower is furnished with very attenuated segments, the profusion of the racemes makes *D. teretifolium* a most attractive species when in full bloom, and has earned for it in some districts the rather appropriate vernacular name of "Clematis Orchid". One of us remembers a swamp-oak on the Myall Lakes in N.S.W. which in August could be clearly identified from the hills four miles away, by the masses of snowy blooms hanging from trunk and branches. He estimated that the tree carried at least 100 plants.

52. *D. TETRAGONUM* Cunn. in Lindl., *Bot. Reg.* (1839), Misc. 33; Benth. 279; *Bot. Mag.* 5956; Bail. *Q. Fl.*, 1527; *Orch. N.S.W.* 117; Gilbert in *A.O.R.* Dec., 1937, 19, et *ibid.* June, 1942, 36; Nicholls in *A.O.R.* Sept., 1942, frontispiece and p. 40. This is the only Australian *Dendrobium* with quadrangular stems, and is therefore easily identified by this peculiar character. Like so many other species, it is very variable. Four varieties have been named, three by Gilbert, *A.O.R.*, l.c., and one by Nicholls in the same journal. The range of the species from south to north is much the same as that of *D. teretifolium*, but it does not extend so far from the coast as the latter. Like that species, it produces giant and dwarf forms; but in each of the known forms, allowing for a slight margin either way, the floral dimensions remain constant. The type form has the smallest flowers; this is the common N.S.W. form. Gilbert's var. *Hayesianum* was discovered in the Illawarra district south of Sydney, but though comparatively rare, it is now known to have the range of the species. It is in Queensland, particularly in the north, that the giant flowers are most in evidence. Expanded sepals of var. *giganteum* have been measured 28 cm. from tip to tip. These large flowers are also more richly coloured than the small ones. Often they bear a striking (but superficial) resemblance to those of the terrestrial *Catadenia Patersonii*, and like the latter, the species is sometimes called "Spider Orchid". Nicholls's var. *tomentosum* is one of these northern "Spiders", its varietal name alluding to the unusual tomentose labellum. The plate in *Bot. Mag.*, l.c., shows flowers somewhat similar to those of var. *Hayesianum*, but more robust. A form with small cream flowers is reported from Proserpine, North Queensland; but we have not seen this, and the report has come too late to enable us to give any definite information here.

53. *D. UNDULATUM* R. Br. 332; Lindl. *Gen. and Sp. Orch.* 87; Benth. 279; Fitzg. *A.O.* ii, 3; T. T. Taylor in *A.O.R.* June, 1944. Syn. *D. discolor* Lindl. *Bot. Reg.* 1841, t. 52.

This is the "Golden Orchid" of Queensland; and we cordially commend Taylor's article just cited as an admirable account of one of the largest and most spectacular plants in the whole range of *Dendrobium* species. Those of us who know *D. undulatum* only from occasional specimens seen in orchid exhibitions or private collections can form little idea of the magnificence of this regal plant in its native habitat, so ably described by Taylor. It is not easily cultivated outside the tropics unless assisted by artificial heat; yet in its native haunts it is exceedingly hardy, braving the elements on wind-swept mountains, or often clinging to bare rocks where it is splashed by the salt spray of wild seas. Sometimes it exceeds 5 m. in height. The flowers, borne profusely on large racemes, are a rich golden brown or bronze colour. The plant exhibits a marked tendency to produce "multiple" flowers, sometimes with their segments joined back to back, or sometimes with 8 to 10 undersized flowers massed together on one pedicel, forming a miniature raceme within a raceme. The species is found northward from Port Curtis to Cape York, and is abundant on many of the islands off the Queensland coast. It extends to New Guinea and the Solomon Islands. The specific name is of course in allusion to the characteristic undulation of the perianth segments.

Var. *fimbriabium* Rchb. f. in *Gard. Chron.* (1878), I, 40. Lateral lobes of the labellum fimbriate.

Var. *Broomfieldii* Fitzg. *A.O.* ii, 3 (double-page plate). Stems rather angular; flowers bright canary-yellow.

54. *D. VARIABLE* Nicholls in *N.Q. Nat.* Sept. and Dec., 1938. We confess that we find considerable difficulty in reaching any satisfactory conclusion about the identity of this diminutive species. The author directs attention to an error in the key accompanying his plate, where *D. variabile* is named *D. dimorphum*. It is figured along with *D. uchenastrum* and *D. Prenticei*. The close relation between the latter and *D. variabile* is evident, *D. Prenticei* showing less variation in the form of the leaves, and bearing a shorter pedicel for the flower. But with living plants, of which we have both received specimens from the Atherton Tableland and other



Text-fig. 4.—*Dendrobium luteocilium*. Inset: Upper surface of labellum (enlarged).
Text-fig. 5.—*Dendrobium Wilkianum*. Inset: Upper surface of labellum (enlarged).

North Queensland areas, we do not find it so easy to distinguish between the species as Nicholls's plate would suggest. We recognize that this group of small orchids, which includes *D. aurantiaco-purpureum* also, presents a very formidable problem in taxonomy; and it is with full appreciation of the value of his efforts to solve that problem, that we again express the hope that Nicholls will yet give us a more complete exposition of the solution he considers he has reached. (Text-fig. 3, C.)

55. *D. WILKIANUM* Rupp in *N.Q. Nat.*, Dec., 1941, and March, 1942. This species was discovered by G. Bates and Kerns in the Cairns district of North Queensland in 1934; but was not described until J. H. Wilkie sent a living plant from the same area (Babinda) in 1941. It is a robust plant, in habit somewhat resembling a gigantic *D. aemulum*, but the flowers are very different. They are comparable in size with those of *D. undulatum* or *D. fuscum*, and the affinities of the species appear to be chiefly with the latter; but there is neither undulation nor twisting in the perianth segments. Racemes carry from 3 to 12 flowers of a dull brownish colour, the labellum being yellowish-green, traversed by numerous dark red lines across the lateral lobes. (Text-fig. 5.)

Doubtful Species.

- D. QUADRILOBUM* Rolfe in *Kew Bull.*, 1896, 44; Rupp in *N.Q. Nat.*, March, 1942. Late in 1941 Rupp received from the Brisbane Herbarium a small specimen consisting of a few pseudobulbs, one mutilated leaf, and two perfect flowers. It was obviously a *Dendrobium*, and was collected by K. Kennedy 20 miles west of Paluma, which is about 60 miles from Townsville, North Queensland. It was very distinct from any known Australian species, and Rupp proposed to describe it under the name *D. quadrilobum*, in allusion to the conspicuously bifid mid-lobe of the labellum, which gave that segment the appearance of being 4-lobed. Discovering, however, that this name had been already used by Rolfe, he studied the description given by

Rolfe in *Kew Bull.*, l.c. The name was applied to a plant received from Australia, but no locality was given; and Rolfe expressed the view that it came from New Guinea or one of the adjacent islands. The description of the flowers seemed to fit Kennedy's plant pretty well. But Rolfe assigned his species to the section *Cadetia*, which has since then been removed from *Dendrobium* and restored to generic rank. It would be quite out of the question to place the Paluma plant in *Cadetia*. It is a genuine species of *Dendrobium*, and in Rupp's opinion belongs to the section *Cuthbertsonia*. The flowers are large in proportion to the plant; the longest pseudobulb of the plant in Rupp's collection at the Sydney Herbarium measures 3 cm., and the flowers are 2 cm. in diameter. We cannot be sure, then, whether this plant is really Rolfe's *D. quadrilobum* or an undescribed species. Unfortunately the specimens which Kennedy had in cultivation were destroyed by rats, and he has been unable to find any more plants which can be definitely identified with those of 1941. He has sent down one obtained about five miles from the original locality, but this appears to us to be a very young plant of *D. fusiforme*; at all events, it is unlike the 1941 specimens. For the present, therefore, the identity of the Paluma species is doubtful; but since it was unquestionably found growing in Australia, and cannot be included in any known Australian species, we think it right to record it here.

In the above review we have not attempted to provide detailed re-descriptions of the Australian species of *Dendrobium*, but with few exceptions have confined ourselves to indicating the salient points of distinction. On the whole, our paper may be regarded as an expansion and revision of White's synopsis in *A.O.R.*, loc. cit. We hope that it may serve as a stepping-stone towards some future exhaustive monograph on the Australian Dendrobiinae. The author of any such work may find it helpful to be spared the necessity of investigating the excluded species of *Dendrobium* which we have enumerated; and to have available in one publication the notes and references provided above. The time is not yet ripe for such a monograph. Not only is it likely that new species of *Dendrobium* still await discovery; but considerable additions will almost certainly be made to the number of Australian species of the allied genus *Bulbophyllum*, which, although placed by Pfitzer in a separate tribe, approaches very closely to *Dendrobium* in Australia, and might well be dealt with in the same publication.

In conclusion, we desire to express our thanks to all those who, either by sending specimens or answering inquiries or offering suggestions, have made this review possible. It has involved upward of seven months of investigation, and without the help of our many friends we could not have carried it out. We must also acknowledge our great indebtedness to the libraries of the National Herbaria in Sydney and Brisbane, where we have had access to nearly all the publications to which we have made reference.

